PhD Synopsis

1.	**Name of Candidate**	Reetu Sharma
2.	**Title of Synopsis**	**Studies on black carbon pollution in Korba city**
3.	**Name of Supervisor**	Prof. K. S. Patel, SOS in Chemistry, Pt. Ravishankar Shukla University, Raipur, CG
4.	**Place of work**	SOS in Chemistry, Pt. Ravishankar Shukla University, Raipur, CG

5. Introduction

Black carbon (BC) is basically the "soot" left behind after inefficient burning of fuels, waste, etc. A considerable amount of BC comes from the open and indoor burning of materials i.e. gasoline, coal, biomass, waste, etc. These fine particles of soot have the ability to affect both health and climate [1-2]. The BC is the second largest contributor to climate change after CO_2 and is a significant part of the haze often in the mega cities. The dark color of BC attracts and absorbs heat from sunlight, causing atmospheric temperature to rise. This is particularly dangerous in the Arctic, Himalayas where BC settles on snow and ice, causing these surfaces to heat up and melt. The melting of glaciers and other large ice masses not only contributes to the rise of global sea levels, but also adds significant amounts of fresh water to salty oceans, which could shift the ocean circulation patterns that affect the climate [3].

Black carbon is so small that they can infiltrate the deepest recesses of the lungs and cause significant damage to the respiratory system including irritation, chronic bronchitis, aggravated asthma and difficulty breathing [2].

The toxicants such as heavy metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), etc. are generated during the burning of the materials i.e. biomass, coal, etc. [4-6]. They are persistent and cause serious health hazards to the living organism [7-12].

In Chhattisgarh, the Korba (22° 21′ 0″ N, 82° 40′ 48″ E) has rich deposits of coal for which it is also known as the land of black diamonds. A huge amount of coal, >10000 MT annually is consumed by various unit of thermal power plants to generate electricity of ≈ 40000 KW. The Asia's biggest Aluminum plant is also in operation by pouring the effluents in the environment. The environment of Korba city is polluted with BC and other toxicants such as heavy metals, etc. [13]. In the proposed work, the Korba city has been selected to study the chemistry of the BC and other related toxicants.

6. Objective of Proposed Work

- During burning three types of carbons: black carbon (BC), organic carbon (OC) and carbonate carbon (CC) are emitted. Their contaminations in the dust, soil and sediment of Korba city are to be investigated.
- The coal is a dirty fuel, enriched with the heavy metals and emitted in the environment when burnt. The heavy metal quantification in the dust, soil and sediment of Korba city is carried out.
- The POPs i.e. PAHs, PCBs, etc. are generated during the burning processes by reaction of the carbon atoms with hydrogen and chlorine at the high

temperature. They are very toxic and their characterizations are carried out in the environment of Korba city.

- The mobility of the toxicants in the soil and sediment of Korba city are studied.
- Sources of these toxicants in the environment (i.e. dust, soil and sediment) of Korba city are apportined.
- The health impact of these pollutants in the Korba city is investigated.

7. Preliminary Work Done

The contamination of heavy metals i.e. As, Mn, Cu, Cd, Pb, etc. in the surface soils and some common plants was studied [13]. Several folds higher concentration of the toxic metals i.e. As, Pb and Cd was found to be associated in the soil and common plants of Korba city. The environment (i.e. dust, soil, sediment, etc.) of Korba city is contaminated with fluoride at the elevated levels [14-15]. In addition, the contamination of sediment of Korba city with elevated levels of the POPs was observed [16].

8. Methodology

The environmental samples i.e. dust, soil, sediment, etc are collected by using the standard methods from >20 sites of Korba city [17-19]. The sampling sites are presented in Figure 1. The following techniques are used for analysis of carbon, metals, PAHs and PCBs, Table 1. The cluster and factor analysis are used to differentiate theorigin of the pollutants in the environment of korba city [20-21].

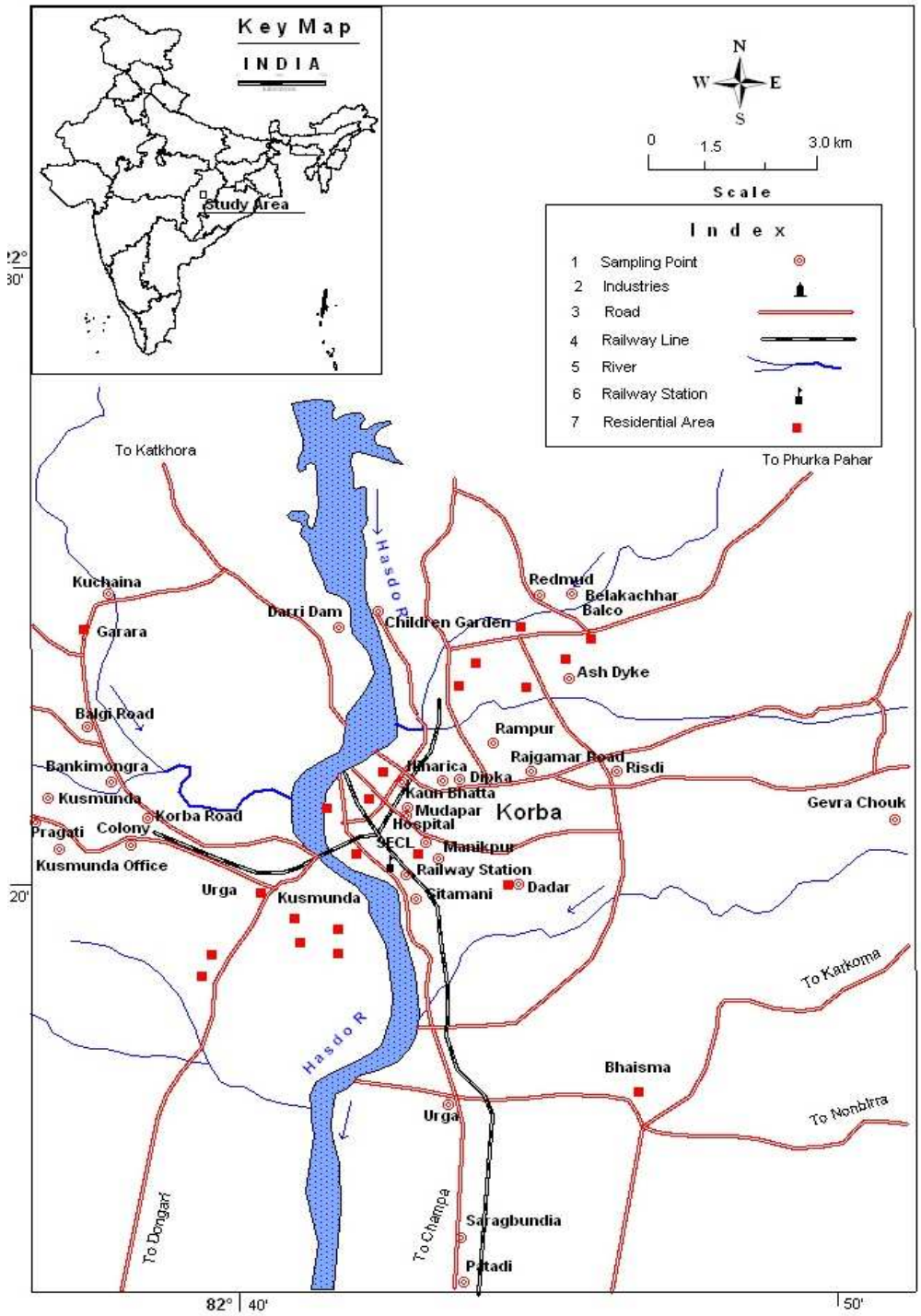

Figure 1: Representation of sampling locations in Korba city

Table 1. Description of technique used for analysis

Sample	Technique	Institute
Black carbon	Thermal method	NIT, Rourkela
Metals	AAS/ICP-AES	NIT, Rourkela
PAHs	HPLC	NPL, Delhi
PCBs	GC-MS	NPL, Delhi

9. Output of Proposed Work

- Understanding of contamination extent, distribution patterns and sources of toxicants in the environment of Korba city.
- The health hazards of the toxicants in the humans of Korba city.
- Identification of major entry routes of the toxicants in the humans.

10. References

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11. Publication

- K. S. Patel, B. Ambade, N. K. Jaiswal, R. Sharma, B. Blazhev, M. Lautent, P. Bhattacharya, Arsenic and other heavy metal contamination in central India, the 4th International Congress on Arsenic in the Environment, Crains, Australia, July 2012, Presented.

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